SeaTracer™

S.287 Class B AIS Transponder

(FCC ID: RIKS287)

USER MANUAL

SevenStar Electronics Ltd

ISO 9001 Registered Firm

About this manual…

This manual contains details and recommendations for the programming, installation and use of the ***SeaTraceR*** S.287 Class B AIS Transponder from SevenStar Electronics Ltd. Please read through the installation notes carefully BEFORE attempting to connect power to the unit. The unit will need programming with your MMSI before it will be fully functional. Please note that incorrect installation or operation may void your warranty.

Unpacking…

The carton contains your *SeaTraceR* Class B AIS transponder with mounting bracket and integral power lead, this User Manual, a combined serial/NMEA data cable and a CD-ROM containing programming software, an electronic copy of this manual and additional information.

To install and operate the unit, you will also need a +12Vdc nominal power source, a VHF antenna and a GPS antenna (these should be separate from other antennae fitted to the vessel).

Note: BEFORE installation, your vessel's MMSI and other data needs to be entered into the unit. This may be performed using SevenStar's 'proAIS' software, but note that for US territories the FCC have ruled that this must be done by an appropriately qualified person such as a suitably trained installer or dealer. Furthermore, it is a Federal offence to knowingly enter an unauthorised MMSI or false static data. (Please contact your dealer if you need assistance or advice.)

Once programmed and installed, the *SeaTraceR* Class B AIS transponder will be able to automatically exchange MMSI, vessel name, position, call sign, course and speed data with other vessels and shore stations. Other suitably equipped vessels will be able to see your position clearly.

Connect your *SeaTraceR* unit to your chart plotter or PC with the data cable provided to SEE the full benefits of AIS - **you** will then be able to see the ID, position, speed and course of all AIS equipped vessels in range!

Please now take the time to read the rest of this manual to get the best from your Class B AIS Transponder.

Please dispose of any unwanted packaging responsibly.

User Manual Contents…

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Warranty…

This product carries a 2-year return-to-factory warranty against defects due to faulty manufacture or materials (i.e. 2 years from date of manufacture). In the event of a problem, please follow the simple trouble-shooting guide in this manual before contacting your dealer.

Declaration of Conformity…

SevenStar Electronics Ltd declares that this product is in compliance with the essential requirements and other provisions of the R&TTE directive 1995/5/EC. A full Declaration may be viewed or downloaded from our web site at www.sevenstarelectronics.com

Intended EC country of use:

GB FR ES SE
AT NL PT DK
NO BE IT FI
IE LU GR CH

The product carries the CE mark, notified body number and alert symbol as required by the R&TTE directive.

CE0168①

The *SeaTraceR* is approved by BABT and BSH in the EU, and by USCG and FCC, and carries the FCC ID: **RIKS287**

Radio Licensing…

IMPORTANT: In most countries the operation of an AIS unit is included under the vessels marine VHF licence provisions. The vessel on to which the AIS unit is to be installed must therefore possess a current VHF radiotelephone licence that lists the AIS system and the vessel Call Sign and MMSI number. Please contact the relevant authority in your country for more information.

General Notices…

- The marine Automatic Identification System (AIS) uses a satellite-based system such as the Global Positioning Satellite (GPS) network to determine position. The accuracy of these networks is variable and is affected by factors such as the antenna positioning, how many satellites are used to determine a position and how long satellite information has been received for. It is desirable wherever possible therefore to verify both your vessels AIS-derived position data and other vessels AIS-derived position data with visual or radar based observations.
- The compass safe distance of this unit is 0.5m or greater (for 0.3° error as per specification).
- In accordance with a policy of continual development and product improvement the *SeaTraceR* hardware and software may be upgraded from time to time and future versions may therefore not correspond exactly with this manual. When necessary upgrades to the product will be accompanied by updates or addenda to this manual. (Check on web site)
- Please take time to read this manual carefully and to understand its contents fully so that you can install and operate your AIS system correctly and get the full benefit.
- Information contained in this manual is liable to change without notice. SevenStar Electronics Ltd. disclaims any liability for consequences arising from omissions or inaccuracies in this manual and any other documentation provided with this product.

Accessories available…

SX.588 Combo AIS/GPS Antenna - only one antenna to install!

SX.272 VHF Antenna Splitter - allows the SeaTraceR to share your existing VHF radio antenna.

Check web site for latest info: http://www.sevenstarelectronics.com

Installation…3 easy steps

Installing the *SeaTraceR* is straightforward using simple tools, but you will need to check you have everything ready first.

Step 1 The unit must be programmed with your MMSI, vessel name, size, etc. **In US territories this must be done by a suitably qualified installer or dealer.** The MMSI is usually listed on the vessel's radio license. If you do not have one, you will need to apply for one – ask your dealer or Coastguard if in doubt.

Step 2 Mount the unit safely, out of the way, in a protected place.

Step 3 You have to connect up the unit – the connections are shown below

CAUTION - do NOT connect to 24 volt power supply. This will cause internal damage and will invalidate your warranty.

SeaTraceR
AIS Class B Transponder

+12Vdc nom (Red/brown =+ve)

NMEA/serial data cable

VHF antenna*

GPS antenna*

a) The SeaTraceR comes with a 1metre supply lead for you to connect up to your vessel's +12Vdc supply **– it is strongly recommended that you fit an in-line fuse, 2A rated**

b) VHF antenna* – mount as high on the vessel as practical for best performance, clear from obstruction or other antennas, and must be fitted with a 50 ohm TNC plug. (See page 15)

c) GPS antenna* – this must be an ACTIVE type (has a built-in amplifier). Mount with a clear view of the sky, away from any possible sources of interference. Must be fitted with a 50 ohm TNC plug. (See page 16)

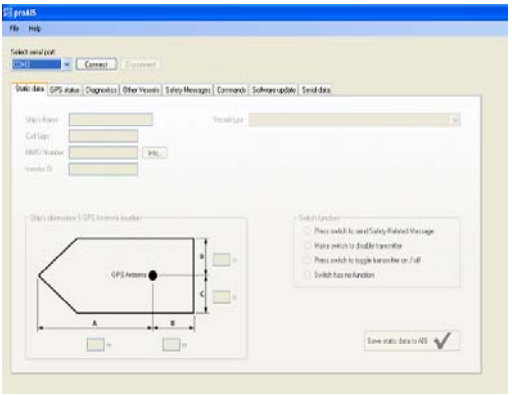
d) To view the received vessel positions, etc, connect the 9-way serial/NMEA port on the unit to your laptop PC or chart plotter, which must be running software capable of reading and displaying AIS B data, using the data cable provided.

*Alternatively, you can use the SX.588 combined GPS/AIS antenna available from SevenStar, which makes installation even easier.

1. **Programming** the transponder…

Before any AIS Class B Transponder will operate fully, you need to program in a few very simple details about your vessel:

- MMSI
- Vessel name
- Call sign
- Vessel Type
- Dimensions including position of GPS antenna



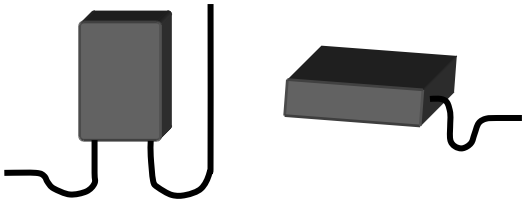
Note: In US territories, the FCC has mandated that this data must be entered by a qualified professional person, and it is a Federal offence to knowingly enter false data.

To program the *SeaTraceR*, you will need to run SevenStar's 'proAIS' programming software. Connect the serial port on your PC to the unit to be programmed using the cable provided (see p10). (*Notes: If you do not have a serial port, use a commercially available USB to serial converter. If you need to extend the cable, use a standard serial cable extender. If you are using the NMEA/RS422 option, the extender must be fitted at the SeaTraceR end.*) You will also need to connect +12Vdc power to the unit using its normal power lead. Check the correct com port is selected, and click 'Connect'. Follow the on-screen instructions on the PC, and enter the data as requested. **Note that once you confirm the MMSI, you will not be able to change it** (just like DSC Class D radios). If you need to change it in the future, for a new vessel, it can be 'unlocked' (reset) by one of our distributors. The proAIS software can be used to read and change the other data and user-programmable options at any time if needed in the future. ***(See pages 13-14 for more information about the 'proAIS' software, and p16 for details of 'Silent Mode' and SRM options which can be programmed.)***

Your dealer can also assist you with programming – just make sure you have your vessel information with you! And please complete all the data fields to get the most out of your new AIS transponder!

2. **Mounting** the unit…

It is recommended that the unit is attached to a solid wooden, fibreglass or composite surface with >15mm long self-tapping screws or similar. Position the unit and the cables so that any water running down the wires drips off rather than collecting on the unit.



Note: the bracket provided can be used to mount the unit in several orientations - simply unscrew the black knurled thumbscrews, and fit the bracket in the orientation that suits you. Once installed, you can think of the unit as a computer modem – you should have no *need* to check it regularly – so mount it out of the way where it will not be knocked or subject to excessive vibration, temperature, sunlight, fuel or water. **It should be mounted at least 0.5m from any magnetic compass.** It makes good sense to have the LEDs visible in case you do ever need to check the unit.

CAUTION: The *SeaTraceR* unit is designed for operation in the temperature range -25 °C to +55 °C. Do not install (or use) the *SeaTraceR* unit in environments which exceed this range.

CAUTION: Do not install the *SeaTraceR* unit in an environment where it can be subject to excessive exposure to water.

CAUTION: The casing of the SeaTraceR unit is NOT isolated from the negative terminal of the supply and therefore it is recommended that the unit is not attached to metal parts of the vessel. (This avoids any potential 'ground loop' problems.)

CAUTION: BE SURE TO USE THE CORRECT TOOLS AND SAFETY EQUIPMENT WHEN INSTALLING THE UNIT AND THE ANTENNAS. IF IN DOUBT, ASK A PROFESSIONAL TO INSTALL IT FOR YOU.

3. **Connecting** the *SeaTraceR*…

WARNING: DO NOT connect the *SeaTraceR* unit to a mains (line) AC electrical supply, as an electric shock or fire hazard could result.

CAUTION: Do not connect the *SeaTraceR* unit to a DC supply exceeding 15.6 V or reverse the supply polarity. Damage to the unit may result.

VHF antenna: For best performance, use a VHF antenna that covers up to 162.025MHz – **not all do**! Mount as high on the vessel as practical for best performance, clear from obstruction or other antennas, and it must be fitted with a 50 ohm TNC plug. (These connectors were designed for use in marine environments, and provide a splash-proof connection when mated.) Adaptors are available for different connector types. See safety warning in Appendices about antenna positioning.

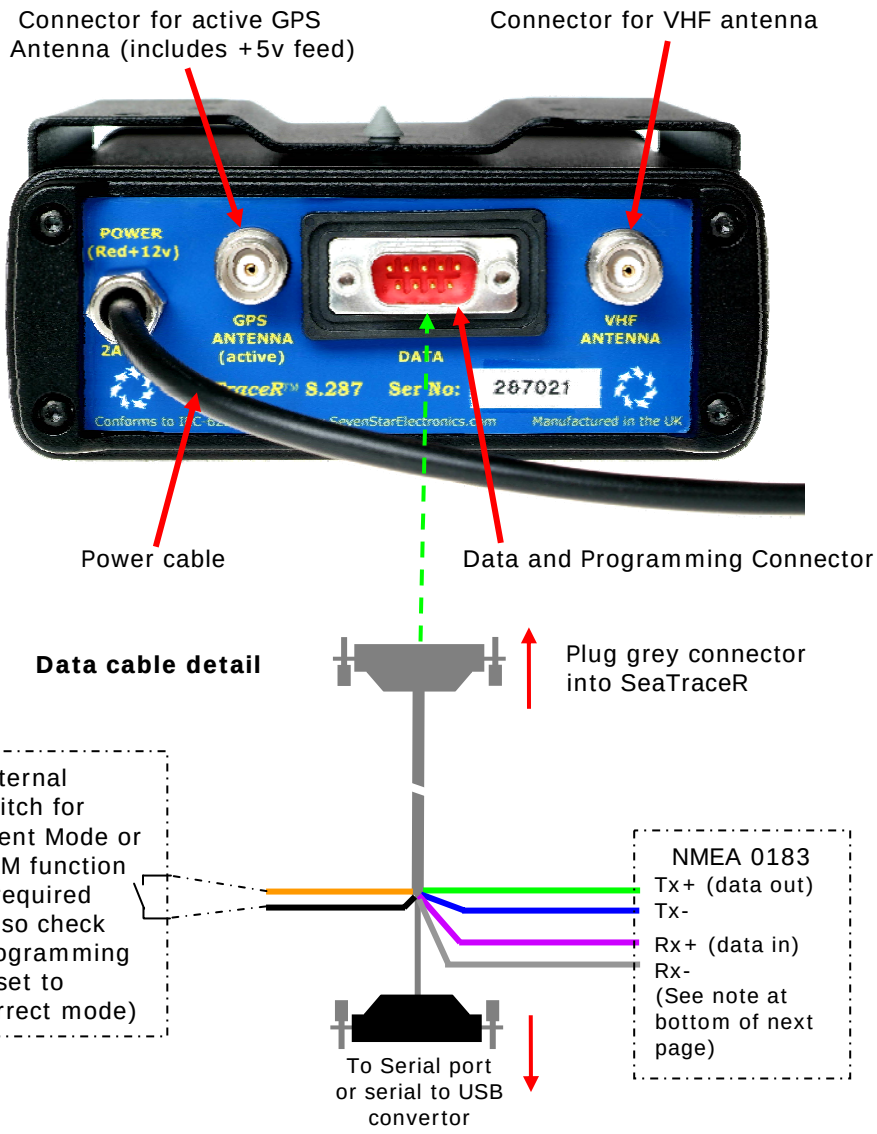
GPS: The *SeaTraceR* unit requires a **+5v-powered** active GPS antenna, suitable for a marine environment, and the down lead will need to be terminated in a TNC 50 ohm plug. The *SeaTraceR* feeds +5v to the antenna automatically via the GPS antenna lead – you do not need a separate supply.

Alternatively: SevenStar have developed a combined GPS/AIS antenna for use with its AIS products. This makes installation quick and easy. Ask for details on our Marine-quality SX.588 combo antenna!

Data: In order to **see** the data from approaching vessels and aids to navigation, you need to display the messages the *SeaTraceR* receives and decodes. To do this you need to connect a chart plotter, laptop PC, PC serial terminal or other display device to the *SeaTraceR* Serial/NMEA data port (9 way male sub-D connector on the rear panel). To connect to a PC or similar device, use the cable provided to connect to the PC serial port (CAUTION - ONLY WORKS THE RIGHT WAY ROUND! See diagram on p10). To connect to a NMEA instrument, use the NMEA/RS422 connections on the cable provided (connections are shown on p10). Note that the software in the display device must be configured for AIS operation AND must be able to receive the standard Class B operation NMEA sentences. This external display unit software is *not* part of the *SeaTraceR* transponder package – consult the manufacturer of the unit if you are in doubt about it – most manufacturers are issuing free upgrades for their units.

Power: Connect a 12V DC power source (9.6-15.6V) capable of supplying 2A peak to the DC power lead (**brown/red = positive**, black/blue=negative). **IT IS STRONGLY RECOMMENDED THAT AN IN-LINE FUSE IS USED, RATING 2A.**

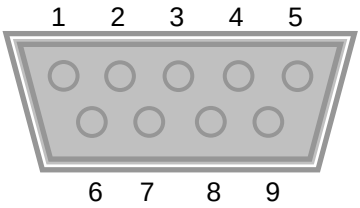
View of SeaTraceR rear panel



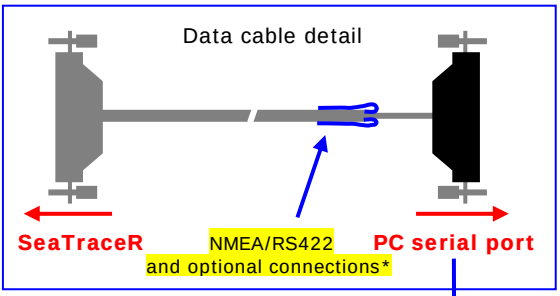
Serial Data Connection…

There is a 9-way D-type male connector mounted on the rear panel of the *SeaTraceR* transponder. This connector is used initially to program the unit with your MMSI, vessel name and other vessel data, and then once the transponder is installed, to send data about other vessels to your plotter or PC software for display.

The connector provides input/output of data in two different formats, RS232 and RS422/NMEA – either may be used. The pin connections are shown in the following diagram (as seen looking at the rear panel):



Data connector on rear panel of SeaTraceR



PIN	FUNCTION	WIRE COLOUR	PC plug connections
1	*Silent mode/SRM +ve	BLACK	
2	RS232 Tx (data out from unit)	BROWN	2
3	RS232 Rx (data in to unit)	RED	3
4	*Silent mode/SRM -ve	ORANGE	
5	RS232 Signal ground, cable screen	YELLOW	5
6	RS422 Tx +ve (data out from unit)	GREEN	
7	RS422 Tx –ve	BLUE	
8	Rs422 Rx +ve (data in to unit)	VIOLET	
9	RS422 Rx –ve	GREY	

Note: wire colours may vary from that stated. If in doubt, buzz it out.

A chart plotter, PC or other display device may be connected to the *SeaTraceR* via an appropriate cable assembly. The default baud rate of the data link is 38,400 Baud with 8 data bits, one stop bit and no parity. No handshaking is used. The data interface conforms to IEC 61162-1. If your NMEA device only has one Tx and one Rx line, use the +ve signals above, and join the -ve wires together and use them as the NMEA common.

Using your new transponder…

Switching on…

When the +12V supply is switched on all four LEDs visible on the front panel of the unit will flash twice. The red green and blue LEDs will then go out, leaving the yellow LED lit. All GPS receivers need to 'lock' onto the signals from at least 3 satellites before they can compute a position, so there is a delay before full operation is available - this process may take up to **30 minutes** worst case if the GPS receiver is starting from 'cold' (no previous position information). When this has been achieved, there is a further short delay until the unit transmits its first position report (message 18) whereupon the yellow LED will go out and the green LED will illuminate, indicating that the unit is now operating correctly. The blue LED will flash each time an incoming AIS messages is received (unless the SRM function has been selected - see p16).

GREEN	YELLOW	RED	BLUE	LED
Power & Status OK	Unable to transmit	Fault detected	Data received	FUNCTION

Your AIS Class B Transponder is now fully working! Your plotter or PC, if connected and set correctly, should now show you all AIS-equipped vessels within range (and remember, this includes all commercial vessels > 300 tonnes, which HAVE to fit AIS transponders, and AIS-equipped AtoNs and racons, as well as the growing numbers of leisure craft and work boats now fitting these units.) And of course, your position will also be shown on THEIR displays.

Getting the most from AIS…

Some hints and useful advice:

- Switch it on! Your *SeaTraceR* consumes less than 4 watts – less than a single nav light. Only switch it off when you are safely tied up in harbour.
- Keep it fully operational! – then other vessels, Coastguard or VTS (Vessel Traffic Services) in port areas will be able to call you if they see you running into danger.
- Read the manuals for your plotter or chart software to make sure you are displaying the AIS targets in the most useful way. It may be possible to filter what is shown to avoid too much clutter in crowded waterways – and make sure you are not using too large a range relative to your speed.
- AIS targets are usually shown as triangles giving position and heading. A vector may also be shown to indicate speed over ground so you can assess any collision risk.
- Aids to navigation (AtoNs) such as buoys, channel markers and lighthouses are being increasingly identified by AIS transmissions at regular intervals. Shore stations will also be capable of creating "virtual AtoNs" where a warning will appear on your chart in the appropriate position without there being a buoy physically in position. This is likely to be used for temporary situations such as wrecks, or buoys which are out of position.
- For maximum help in poor visibility, AIS should ideally be combined with radar. Radar can show passive targets such as debris or vessels not equipped with functioning AIS transmitters. AIS will help to identify targets acquired by radar plotting aids such as MARPA, which can give automatic warnings of close approach.
- Always plan to keep a safe margin to avoid close quarters situations – at least 0.5nm closest point of approach (CPA), and more for vessels restricted in ability to manoeuvre. Aids such as AIS and MARPA can give a false sense of security; so don't forget to use the 'Mk.1 Eyeball' to confirm the situation and to navigate according to the Collision Regulations.
- The Collision Regulations are not negotiable, but if you are uncertain of another vessel's intentions and they have an AIS transmitter, then you will be able to readily call them on as you have their call-sign and vessel name.

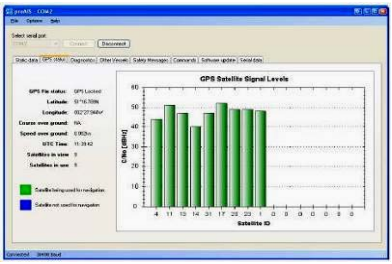
'proAIS' software...

If you have been provided with a CD-ROM with your SeaTraceR, it contains a 'soft' copy of this manual, plus some interesting and informative software called 'proAIS'. In order to use it, load the software onto your PC, then connect your *SeaTraceR* to your PC using the serial 9-way cable provided to a suitable serial port. (If your PC does not have a serial port, you can connect using a USB-to-serial adaptor widely available from computer stores.) Connect +12v power to the *SeaTraceR*, start the 'proAIS' software, make sure the correct port on your PC is selected, and then click the 'Connect' button.

proAIS allows you to program your vessel data into the Transponder, (this has to be done by a dealer or other competent person in USA), and also select some user options (see p16). It also offers you a number of ways of looking at the AIS data being processed by your *SeaTraceR* Transponder, and also at the operation of the integral GPS receiver. There are a number of pages arranged as 'tabs' across the top of the page.

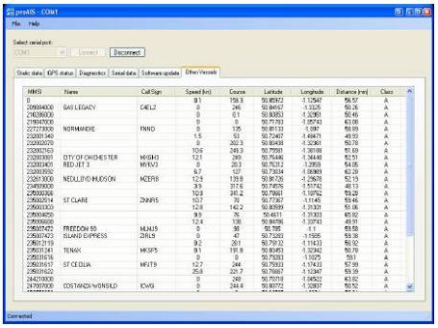
Static Data: This page displays the static data relating to the vessel, including the MMSI which must be programmed before the unit will function as a two-way transponder, and also some user-programmable options. See page 6 of this manual, and p16.

GPS Status: This tab shows the status of the internal GPS receiver, and includes the current position fix, course and speed as well as bar graphs of the strength of the GPS satellite signals being received. This can be used to verify correct GPS antenna connection and operation.

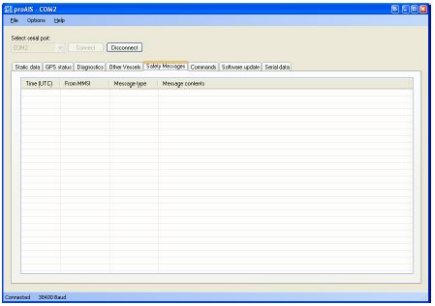


Diagnostics: This tab shows the internal condition of the *SeaTraceR*. It includes the information used to drive the LED's on the unit front panel, software version numbers, internal power supply measurements, and some statistics on numbers of messages received on each of the two AIS VHF channels. When you turn on you will see the conditions change as GPS lock is achieved, and messages are received and transmitted.

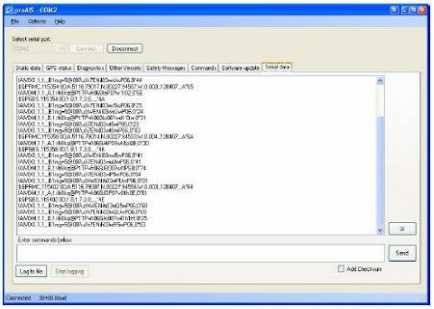
Other vessels: This page displays messages received from other vessels transmitting AIS data in your vicinity. Data from Class A transponders is shown in black text, and that from Class B Transponders is shown in blue text. MMSI, vessel name and call sign is displayed, along with speed, course, and latitude and longitude. An estimate of each vessels distance from you is also given.



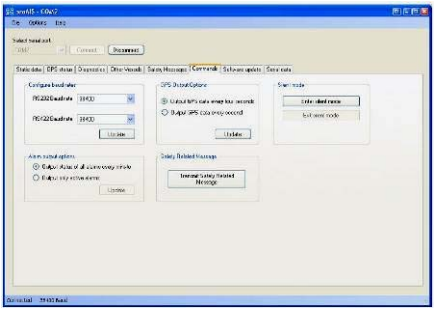
Safety messages: AIS-equipped vessels have the ability to send text 'Safety Related Messages', either in Broadcast or Addressed mode. This page allows you to see any such messages, with their UTC time received and the MMSI of the sender. The exact use of these messages is not defined.



Serial data: This page displays the raw NMEA0183 serial data being processed by the *SeaTraceR*. There is a facility to create a log file where received NMEA data can be logged.



Commands: Under this tab there are some more user-selectable options for your *SeaTraceR* unit. You can set the port data baud rate, and **how often GPS data and alarm data is output via the serial link**. Depending on software version installed, you may also be able to select 'silent mode', and/or set-up & send a 'Safety Related Message'



Maintenance…

The *SeaTraceR* unit is sealed against ingress of water or dust to IP-65. There are no user-serviceable parts inside, and the unit is protected against tampering, so DO NOT ATTEMPT TO OPEN THE UNIT. No regular maintenance is required other than wiping down with a soft cloth as necessary, and keeping the connectors in good condition.

WARNING: Unauthorised opening of the *SeaTraceR* unit, or use outside recommended conditions, will invalidate the warranty.

CAUTION: Avoid using chemical solvents to clean the *SeaTraceR* as some solvents can damage the case or label material.

NOTE: The *SeaTraceR* unit contains no user serviceable parts. Contact your Service Agent for repair if necessary.

About SevenStar…

SevenStar was created in 2002 by committed, professional engineers with extensive experience in the design, manufacture, sales and marketing of marine safety electronic apparatus and other high tech communications equipment. SevenStar's S.701 SART (**S**earch **A**nd **R**escue **T**ransponder) set new standards in marine electronics, and its innovative digital design enabled it to be the first to be shipped globally as non-hazardous cargo. It is EU 'Wheelmark' and FCC approved, and it has since captured around 75% share of the latest market segments. SevenStar also designs bespoke transponders for both marine and airborne use.

Both the *SeaTraceR* Class B AIS transponder and *SeaVieweR* dual AIS/GPS Receiver have followed the same market-leading philosophy and both use the latest digitally-defined radio techniques to achieve and exceed the demanding IEC AIS Class B specification released during 2006. The robust, IP-65 rated, powder-coated aluminium enclosure and versatile stainless steel mounting bracket have been designed to service both the professional vessel market and the safety-conscious leisure user equally.

SevenStar is approved and audited annually to ISO 9001:2008. Its GMDSS/SOLAS products are 'Wheelmark' approved and the company is audited annually by Bureau Veritas.

APPENDICES

List of Appendices...

- Options
- Warnings
- Antennas and antenna mounting
- What serial data is sent or received
- Description of LED indicators
- Trouble shooting guide
- More about AIS
- Standards
- *SeaTraceR* Specifications
- Glossary

Options...

*** Silent Mode/Safety Related Message:** If your business depends on *temporary* periods of 'position reporting silence', it is possible to fit a switch to your vessel that will *temporarily* disable the Transmit function of the *SeaTraceR* (***called 'Silent Mode'***). An external switch will need to be wired to pins 1 and 4 of the data connector. (See wiring connections on p10 of this manual). **It must be stressed that this compromises the safety of your vessel and other vessels, and must NOT be done without careful consideration.** During programming, the function of pins 1 & 4 of the serial/data connector can be set to select silent mode with either a continuous switch closure (normal setting) or a momentary switch closure. Alternatively, the Safety Related Message function can be selected - the *SeaTraceR* has the capability of sending what is called a Safety Related Message (SRM) when instructed, transmitted as VDL message number 14. At the time of printing it is currently undecided who should listen and/or respond to any such messages, so we recommend leaving the settings set to select Silent Mode by a continuous switch. To change, click the appropriate 'radio button' then click 'Save to AIS' to store new settings.

*** Blue LED function:** the blue LED usually flashes to indicate the receipt of an AIS message. However, if you select the SRM function the blue LED may be programmed to indicate that an SRM has just been sent (LED stays on for approx 20 seconds).

*** GPS Reporting Rate:** The rate at which your vessels GPS position is sent to your plotter can be set during programming if required.

*** Non-active Alarm Reporting:** Non-active alarm messages are suppressed by default, but can be selected if required.

Warnings…

VHF Antenna Connection…

Connecting a badly mismatched VHF antenna, leaving the VHF antenna port disconnected, using a poor quality or poorly jointed cable, or shorting the VHF antenna port will activate the internal VSWR alarm, causing the unit to stop sending position reports, and may cause damage to the transponder.

Radio Frequency Exposure…

This equipment generates and radiates radio frequency electromagnetic energy and, if not installed and used in accordance with the instructions, may cause harmful interference or even personal injury.

Never switch on the equipment without the VHF antenna properly connected. To maximise performance, and minimise human exposure to RF energy, always mount the antenna at least 1.5 meters from the transponder.

This system has a Maximum Permissible Exposure (MPE) radius of 1.5m, assuming max antenna gain of +3dbi. Use of higher gain antennas would require a greater MPE radius and is not recommended.

The VHF antenna should be mounted at a minimum vertical distance of 3 metres from the head of any person standing on deck in order to meet international safety directives on Maximum Permissible Exposure (MPE) / Specific Absorption Rate (SAR). Failure to adhere to these limits could expose persons within the 3 metre radius to RF radiation in excess of the recommended MPE / SAR limits.

Antennas and Antenna Mounting…

VHF antenna for AIS use…

The VHF antenna employed for AIS use:

- Must be suitable for marine shipboard applications (index of protection, ruggedness, means of mounting, etc.)
- Should be omni-directional and vertically polarised with a bandwidth sufficient to maintain VSWR <1.5 over the frequency range 156 – 163 MHz. As a minimum the -3dB bandwidth must cover the two AIS channels and the DSC Channel.

- Should ideally be a dedicated antenna, i.e. not shared with any other VHF transmitter/receiver.
- Should be mounted with at least a two metre vertical separation distance from any other VHF antenna used for speech or DSC communication but see also the section “Radio Frequency Exposure” Warning above.

GPS Antenna…

The GPS antenna used must be of the active type (i.e. it should incorporate a low noise amplifier) and must be suitable for marine shipboard applications (index of protection, ruggedness, means of mounting, etc.). It must be capable of running from the +5v that is fed up the GPS coax cable. Most +5v active GPS antennas will work well with the *SeaTraceR* on short to medium cable lengths. If you need to use long cables then you may need to select an antenna with a higher gain (in dB) to deliver an acceptable signal level to the *SeaTraceR* GPS antenna connector. (Antenna gain - cable loss should be more than approx 15dB.)

The GPS antenna to be used for AIS use must be a dedicated antenna, i.e. not shared with any other GPS receiver.

Installation of the GPS antenna is critical for the performance of the built -in GPS receiver that is used for correct timing of the transmitted data, and also for the supply of navigational information should the main navigational GPS fail. We strongly recommend that:

- The GPS antenna is mounted in a slightly elevated position and free of shadow effect from the ship’s superstructure
- The GPS antenna has a free view through 360 degrees with a vertical angle of 5 to 90 degrees above the horizon.
- As the received GPS signal is very sensitive to noise and interference generated by other onboard transmitters, ensure that the GPS antenna is placed as far away as possible from radar, Inmarsat and Iridium transmitters and ensure the GPS antenna is free from direct view of the radar and the Inmarsat beam.
- It is also important that any MF/HF and other VHF transmitter antennas are kept as far away as possible from the GPS antenna. Try to keep the GPS antenna at least 3 meters away from these antennas.

What serial data is sent or received…

As mentioned above, the serial port is used for programming the unit as well as for 'passing on' the AIS data received from other vessels, AtoNs and shore stations.

Note: Either RS232 or RS422 connections may be used. RS232 is intended for connection to PC serial ports and similar devices. RS422 is a 'balanced' wiring system, in which +ve and –ve signals are used to give good immunity to noise. These can be used to connect to NMEA ports on plotters, etc. (It is allowable in many cases to just use the +ve connections and ground (0v), but this will be more susceptible to electrical noise.)

Data/message types vary with the activity:

a) During programming, the data/message types are proprietary to the *SeaTraceR*.

b) Power up messages: On power up the unit will report details of the firmware versions residing in the unit.

c) In normal AIS transponder operation, each message received over the VHF Data Link (VDL) is decoded and relayed on to the display unit as a VHF Data Link Message (VDM).

d) Also as part of normal operation, the *SeaTraceR*'s VHF data link own vessel messages (VDO) transmitted over the VDL are also sent to the display unit.

e) GPS own-position reporting messages - the frequency of these can be programmed if required

f) AIS regional channel assignment messages (ACA) received. These are derived from an incoming VHF Data Link message (message 22) or from a DSC message.

g) AIS channel management information source (ACS) messages.

h) Alarm messages (ALR, TXT) can be sent to the display unit and Alarm acknowledgement messages (ACK) received from it. Many internal checks are performed and it is possible to suppress all but active alarms.

i) It is possible to modify the behaviour of the *SeaTraceR* slightly under switch control – see 'Options' section.

(VDM, VDO, ACA, GPS, ACS, ALR, TXT and ACK messages conform to NMEA 0183. Please refer to NMEA 0183 for full details of these AIS messages.)

Description of LED Indicators…

Status – GREEN ('All OK')

This green LED indicates, when lit, that power has been connected correctly to the transponder, that the transponder hardware has been programmed, that the operating software is present and running, that GPS lock has been acquired and position data transmitted, and that the VHF port appears to be connected correctly.

TX Timeout – YELLOW ('Unable to Tx / lost GPS Warning')

This yellow LED indicates, when lit, that the *SeaTraceR* transmitter is currently prevented from transmitting. If the unit has not been able to transmit a position report during the last expected two reporting intervals, either because of loss of GPS lock, or for operational reasons such as a Message 23 quiet period, high channel load conditions, etc, the yellow LED will illuminate. It will also illuminate if the user has chosen to use the 'silent mode' option. This is a *warning condition only* and indicates that your vessels position **is not currently being reported** to other vessels. Reception of other vessel AIS information by the *SeaTraceR* is not affected. When the unit is able to commence reporting again the yellow LED goes out.

Error - RED ('Fault condition exists')

This red LED indicates, when lit, one of the following status conditions:

- Transmitter lockout timer (1 second max) has operated
- GPS is unable to gain lock even after 30 minutes
- VHF antenna VSWR is out of range (poor connection, badly sited antenna)
- Power Supply is out of range
- Background noise level is above the threshold level (-77dBm) (Poor connection and/or poor antenna siting.)

Rx Data - BLUE ('Data is being received')

This blue LED indicates, when it flashes, that a valid AIS message has just been received. This will be lit frequently in a busy environment. Alternatively, if the SRM option is invoked, the blue LED can be programmed to indicate that an SRM has just been sent, in which case the blue LED will remain lit for approx 20 seconds after each SRM is sent.

Trouble-shooting guide…

With all electronic equipment, unexpected or severe transient conditions may leave the equipment in a 'locked-up' state. Every effort has been made to prevent this occurring with the *SeaTraceR*. If you think this may be the case, simply disconnect (switch off) the power connection, leave for a few minutes, and then reconnect the power.

If you have reason to think your transponder is not working correctly, check the following before contacting your technician or dealer:

Unit shows no LEDs lit, sends no data for display:

- Faulty power connection or in-line fuse blown

……Unit should operate normally when fault is fixed

Unit powers up but yellow LED comes on:

- Poor or broken GPS antenna connection, poor antenna position
- GPS signal blocked, either physically, or by excessive electrical noise
- Shore station has requested Class B silent mode
- Heavy local AIS traffic has blocked your AIS transmission

……Unit should recover when the condition is removed.

Unit powers up but red LED comes on:

- Poor or broken VHF antenna connection, poor antenna position
- Interrupted or out of range power connection
- GPS has been unable to lock on even after 30 minutes

……Unit should recover when the condition is removed.

If the Red LED illuminates *continuously* even after correcting these items, the unit should be switched off for a few minutes, then tried again. If the fault persists it can be assumed to be faulty and should be switched off (power removed). Consult your dealer or technician.

Unit powers up with just green LED on, but no data is displayed:

- Poor or incorrect data cable connection to plotter or PC
- Plotter or PC not configured or not able to receive AIS sentences

Note: If you connect a PC running the Windows utility 'HyperTerminal' or similar to the serial port, you should see log data sent regularly. If your terminal settings are correct and you still get no data, either the cable of the unit must be faulty.

Other vessels report they can't see my vessel name or call sign: This data is not transmitted as often as the MMSI, etc, so it can take a little while to appear on screen (up to 6 minutes). **Also, this data message was only introduced in 2006 *so older receiving equipment will need updating to receive/display it correctly*.**

More about AIS...

The marine **A**utomatic **I**dentification **S**ystem (AIS) is a location and vessel information reporting system. It allows vessels equipped with AIS to automatically and dynamically share and regularly update their position, speed, course and other information such as vessel identity with similarly equipped craft and with shore stations. Position information is derived from a Global Navigation Satellite System (GNSS) such as GPS, and communication between vessels or between vessel and shore is by VHF digital transmissions on channel 87B at 161.975MHz, or on channel 88B at 162.025MHz. The system can cope with large numbers of vessels in close proximity because a sophisticated and automatic method of time sharing the radio channel is used to ensure that blocking of individual transmissions is minimised, and any potential degradation of the expected position reporting interval is indicated to the user. If the unit suffers *extreme* channel overload conditions it will always recover to normal operation.

AIS Classes...

There are two classes of AIS unit fitted to vessels, Class A and Class B. In addition AIS base stations may be employed by the Coastguard, port authorities and other authorised bodies. AIS units acting as aids to navigation (AtoNs) can also be fitted to fixed and floating navigation markers such as channel markers and buoys.

Class A units are a mandatory fit under the safety of life at sea (SOLAS) convention to vessels above 300 gross tons or which carry more than 11 passengers in International waters. Many other commercial vessels and some leisure craft also fit Class A units.

Class B units are now becoming mandatory fit in several countries as they look to improve their security and safety. Class B units are designed for fitting in vessels which do not fall into the mandatory Class A fit category. **The *SeaTraceR* is a Class B unit.**

Information Transmitted and Received...

Class A units transmit their IMO number (if known), MMSI, Call sign and Name, length and beam, ship type, time, course over ground (COG), speed over ground (SOG), heading, navigational status, rate of turn, draught, cargo type, destination and safety related messages via a short message service (SMS) facility. Message lengths are variable with static

and voyage related information being transmitted less often.
Class B units transmit their MMSI, Call Sign and Name, length and beam, ship type, time, course over ground (COG), speed over ground (SOG) and heading.

Standards…

This product complies with all the necessary standards under the European R&TTE directive for Article 3.1(a), 3.1(b), 3.2 and 3.3(e). The following standards have been followed in pursuance of this:

- IEC62287-1: 2006-03 Maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 1: Carrier-sense time division multiple access (CSTDMA) techniques
- IEC60945: 2002-08 Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results
- IEC61162-1: Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners
- IEC61108-1: GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) – Part 1: Global positioning system (GPS) —Receiver equipment — Performance standards, methods of testing and required test results
- EN 301 843-1 v2.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for marine radio equipment and services; Part 1: Common technical requirements
- EN 50383: 2002 Basic standard for calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunications system (110MHz – 40GHz)
- EN60950-1: 2001 Information technology equipment – Safety – Part 1: General requirements

SeaTraceR™ Specifications…

Parameter	Value
Dimensions	180 x 110 x 40 mm (L x W x H)
Weight	900g
Power	DC (9.6-15.6V)
	Average power consumption 4W
	Peak current rating 2A
Internal GPS Receiver	IEC 61108-1 compliant
Electrical Interfaces	RS232 38.4kBaud bi-directional
	RS422 NMEA 38.4kBaud bi-directional
Connectors	VHF Antenna connector - TNC 50 ohm coaxial - on rear panel
	GPS Antenna connector - TNC 50 ohm coaxial - on rear panel
	RS232 serial/RS422 NMEA serial/silent mode - 9-way sub-D male connector (PC serial connector) - on rear panel
	+12Vdc (nom) Power - Integral 1 metre twin core lead, red/brown =+ve. ******In-line fuse strongly recommended******
VHF Transceiver	Transmitter - single channel
	2 Independent, simultaneous VHF Receivers (One of which is time shared between AIS and DSC)
	Frequency: 156.025 to 162.025 MHz in 25 kHz steps
Output Power	+33dBm ± 1.5 dB (2 watts nominal)
Channel Bandwidth	25kHz
Channel Step	25kHz
Modulation Modes	25kHz GMSK (AIS, TX and RX)
	25kHz AFSK (DSC, RX only)
Bit rate	9600 b/s ± 50 ppm (GMSK)
	1200 b/s ± 30 ppm (FSK)
RX Sensitivity	Sensitivity - 107dBm 25kHz (Message Error Rate 20%)
	Co-Channel 10dB
	Adjacent Channel 70dB
	IMD 65dB
	Blocking 84dB
Environmental	IEC 60945
	Operating Temperature: -25ºC to +55ºC
	IEC 62287, Section 5, Cat b) protected from the weather
Compass safe distance	0.5 metre
Indicators	Status, TX timeout, Error, Rx Data.
Operator options	a) 'Silent mode', b) Optional safety related message (SRM), c) Blue LED function, d) baud rate, e) error & GPS report rates

Glossary...

+ve	Positive
-ve	Negative
ACA	(AIS) Regional Assignment Channel Assignment Message
ACK	Acknowledgement
ACS	(AIS) Channel management information source messages
AFSK	Audio frequency-shift keying
ALR	(AIS) Alarm Message
AtoN	Aid to Navigation
AIS	Automatic Identification System
BIIT	Built In Integrity Testing
BNC	Bayonet fitting type RF connector
CSTDMA	Carrier Sense Time Division Multiple Access
COG	Course over Ground
CR	Carriage Return
CS	Carrier Sense
DC	Direct Current
DGNSS	Differential Global Navigation Satellite System
DSC	Digital Selective calling
GLONASS	Global Navigation Satellite System (alternative to GPS)
GNSS	Global Navigation Satellite System (GPS, Glonass)
GMSK	Gaussian Minimum Shift Keying
GPS	Global Positioning Satellite / System
HF	High Frequency
IMO	International Maritime Organization
IEC	International Electrotechnical Commission
LED	Light Emitting Diode
LF	Line Feed
LNA	Low-noise amplifier
MF	Medium Frequency

MKD	Minimum Keypad and Display
MMSI	Maritime Mobile Service Identity
MPE	Maximum Permissible Exposure
NMEA	National Marine Electronics Association
PC	Personal Computer
PI	Presentation Interface
RF	Radio Frequency
RTCM	Radio Technical Commission for Maritime Services
RX	Receive or Receiver
RFI	Radio frequency interference
SAR	Specific Absorption Rate
SMS	Short Message System
SOG	Speed over Ground
SRM	Safety Related Message
TDMA	Time-division Multiple Access
TNC	Threaded type coaxial connector
TX	Transmit or transmitter
UTC	Universal Time Co-ordinated
VDM	(AIS) VHF Data Link Messages
VDO	(AIS) VHF data link *own vessel* messages
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

Please Note...

The latest version of this manual is available in the Downloads section of our website, along with further information which may be of interest.

http://www.sevenstarelectronics.com

SevenStar Electronics Ltd